

Borehole

# 50-00-09

Log Event A

## Borehole Information

|                                |                                 |                                  |
|--------------------------------|---------------------------------|----------------------------------|
| Farm : <u>I</u>                | Tank : <u>I</u>                 | Site Number : <u>299-W10-168</u> |
| N-Coord : <u>43,514</u>        | W-Coord : <u>75,908</u>         | TOC Elevation : <u>671.00</u>    |
| Water Level, ft : <u>118.2</u> | Date Drilled : <u>2/28/1977</u> |                                  |

## Casing Record

|                            |                                |                    |
|----------------------------|--------------------------------|--------------------|
| Type : <u>Steel-welded</u> | Thickness, in. : <u>0.237</u>  | ID, in. : <u>4</u> |
| Top Depth, ft. : <u>0</u>  | Bottom Depth, ft. : <u>122</u> |                    |
| Type : <u>Steel-welded</u> | Thickness, in. : <u>0.280</u>  | ID, in. : <u>6</u> |
| Top Depth, ft. : <u>0</u>  | Bottom Depth, ft. : <u>122</u> |                    |

|                                 |                            |
|---------------------------------|----------------------------|
| Cement Bottom, ft. : <u>122</u> | Cement Top, ft. : <u>0</u> |
|---------------------------------|----------------------------|

## Borehole Notes:

Borehole 50-00-09 was drilled in February 1977 to a depth of 122 ft with 6-in. casing. Data from the drilling log and Chamness and Merz (1993) were used to provide borehole construction information. Neither of these references indicate that this borehole was perforated or grouted. The logging engineer reports a single 4-in.-diameter casing at the ground surface, suggesting that the original 6-in. borehole casing contains a 4-in. casing liner. However, the depth to which the casing liner extends is unknown. The thicknesses of the 4-in. and 6-in. casings are presumed to be 0.237 and 0.280 in., respectively, on the basis of the published thicknesses for schedule-40, 4-in. and 6-in. steel tubing.

## Equipment Information

|                                   |   |  |
|-----------------------------------|---|--|
| Logging System : <u>2B</u>        | Detector Type : <u>HPGe</u>               | Detector Efficiency: <u>35.0 %</u>           |
| Calibration Date : <u>11/1997</u> | Calibration Reference : <u>GJO-HAN-20</u> | Logging Procedure : <u>MAC-VZCP 1.7.10-1</u> |

## Logging Information

|                                 |                                  |                                       |
|---------------------------------|----------------------------------|---------------------------------------|
| Log Run Number : <u>1</u>       | Log Run Date : <u>02/04/1998</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>0.0</u>    | Counting Time, sec.: <u>200</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>14.0</u> | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |

|                                 |                                  |                                       |
|---------------------------------|----------------------------------|---------------------------------------|
| Log Run Number : <u>2</u>       | Log Run Date : <u>02/05/1998</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>13.0</u>   | Counting Time, sec.: <u>200</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>65.0</u> | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |

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|                     |             |                      |                   |                     |                     |
|---------------------|-------------|----------------------|-------------------|---------------------|---------------------|
| Log Run Number :    | <u>3</u>    | Log Run Date :       | <u>02/06/1998</u> | Logging Engineer:   | <u>Alan Pearson</u> |
| Start Depth, ft.:   | <u>64.0</u> | Counting Time, sec.: | <u>200</u>        | L/R : <u>L</u>      | Shield : <u>N</u>   |
| Finish Depth, ft. : | <u>98.0</u> | MSA Interval, ft. :  | <u>0.5</u>        | Log Speed, ft/min.: | <u>n/a</u>          |

|                     |              |                      |                   |                     |                     |
|---------------------|--------------|----------------------|-------------------|---------------------|---------------------|
| Log Run Number :    | <u>4</u>     | Log Run Date :       | <u>02/10/1998</u> | Logging Engineer:   | <u>Alan Pearson</u> |
| Start Depth, ft.:   | <u>120.0</u> | Counting Time, sec.: | <u>200</u>        | L/R : <u>L</u>      | Shield : <u>N</u>   |
| Finish Depth, ft. : | <u>97.0</u>  | MSA Interval, ft. :  | <u>0.5</u>        | Log Speed, ft/min.: | <u>n/a</u>          |

**Logging Operation Notes:**

This borehole was logged in four log runs using a 200-s counting time. The top of the borehole casing, which is the zero reference for the SGLS, is approximately flush with the ground surface. The total logging depth achieved by the SGLS was 120.0 ft.

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**Analysis Information**

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Analyst : D.L. ParkerData Processing Reference : MAC-VZCP 1.7.9Analysis Date : 05/21/1998**Analysis Notes :**

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the accepted calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

For purposes of data analysis, it was assumed that 4-in. and 6-in. casings are both present in the borehole. A casing correction factor for a 0.50-in.-thick steel casing was applied to the concentration data because it most closely matched the 0.517-in. total combined thickness of the 4-in. and 6-in. casings.

**Log Plot Notes:**

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the estimated uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A time-sequence plot of the historical gross gamma log data from 1977 to 1993 is presented with the SGLS log plots in the Tank Summary Data Reports for tanks T-106 and T-109.



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Plots that compare the decay rate of the historical gross gamma data with the calculated decay curves for specific radionuclides are included in the Tank Summary Data Report for tank T-106.

Average peak intensities measured from 45 to 55 ft between August 1979 and June 1993 are provided on a time-sequence plot included with the Tank Summary Data Report for tank T-109.

#### **Results/Interpretations:**

The radionuclide concentrations identified in this section are reported as only apparent concentrations and are underestimated.

The man-made radionuclides detected in this borehole are Cs-137, Co-60, Eu-154, and Eu-152. Cs-137 contamination was detected only at the ground surface. Co-60 contamination was detected continuously from 47 to 58.5 ft and from 61 to 95 ft. Several small zones of Co-60 contamination were detected between 97 and 108.5 ft. Co-60 contamination was also detected nearly continuously from 111 to 119.5 ft. Eu-154 contamination was detected continuously from 46.5 to 56.5 ft and nearly continuously from 67.5 to 75.5 ft. Several small zones of continuous Eu-154 contamination were detected between 106 and 118.5 ft. A single occurrence of Eu-154 was detected at 89.5 ft. A continuous zone of Eu-152 contamination was detected from 47.5 to 53.5 ft.

The U-238 concentrations are absent from 47 to 56.5 ft.

The K-40 concentrations decrease at 52 ft. Increased Th-232 concentrations occur from 82 to 91 ft. Sharply decreased K-40 and Th-232 concentrations occur between 91 and 96 ft and between 100 and 105 ft. Sharply increased U-238 concentrations occur between 101 and 105 ft. The K-40 and Th-232 concentrations increase from 106 to 109 ft and generally remain elevated to the bottom of the logged interval.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks T-106 and T-109.